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**University Examinations 2014/2015**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MATHEMATICS AND COMPUTER

**SMA 2430: DESIGN AND ANALYSIS OF EXPERIMENT**

**DATE: DECEMBER 2014 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Define the following terms as used in the design and analysis of experiment;
2. Experimental error (2 marks)
3. Blocks (2 marks)
4. Absolute experiment (2 marks)
5. Extraneous variables (2 marks)
6. Discuss the principles of design of experiment (6 marks)
7. A set of data involving four Chinese drugs A,B,C,D tried on 20 dairy cows to influence milk production were as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Drugs** | **Weight of milk produced by each dairy cow** | | | | |
| A | 55 | 49 | 42 | 21 | 52 |
| B | 61 | 112 | 30 | 89 | 63 |
| C | 42 | 97 | 81 | 95 | 92 |
| D | 169 | 137 | 169 | 85 | 154 |

All the twenty dairy cows were treated alike in all aspects expect the drugs administered to five dairy cows. Analyse the date at 1% level of significance. (6 marks)

1. Given v=6, b=4, msse= 15.31 and mssb=73.14. Estimate the relative efficiency of RBD

and CRD

1. Consider the following results of an experiment involving six treatment t1,t2......t6 in four randomized blocks B1, B2, B3 and B4.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Blocks** | **Treatment and yield** | | | | | |
| B1 | t1  24.7 | t3  27.7 | t2  20.6 | t4  16.2 | t5  16.2 | t6  24.9 |
| B2 | t3  22.7 | t2  28.8 | t1  27.3 | t4  15.0 | t6  22.5 | t5  17.0 |
| B3 | t6  26.3 | t4  19.6 | t1  38.5 | t3  36.8 | t2  39.5 | t5  15.4 |
| B4 | t5  17.7 | t2  31.0 | t1  28.5 | t4  14.1 | t3  34.9 | t6  22.6 |

At =0.05, test whether; (6 marks)

1. Treatment differ significantly
2. blocks differ significantly

**QUESTION TWO (20 MARKS)**

1. In the table given, are the yields of six varieties of wheat in a four replicate treatment for which one value is missing. Estimate the missing value and analyse the date. (12 marks)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Blocks** | **Treatment** | | | | | |
| 1 | 18.5 | 15.7 | 16.7 | 14.1 | 13.0 | 13.6 |
| 2 | 11.7 | x | 12.9 | 14.4 | 16.9 | 12.5 |
| 3 | 15.4 | 16.6 | 15.5 | 20.3 | 18.4 | 21.5 |
| 4 | 16.5 | 18.6 | 12.7 | 15.7 | 16.5 | 18.0 |

1. in the model =where ~N(o,. show that Duncan’s multiple Range test DMRT is given by (8 marks)

t=

**QUESTION THREE (20 MARKS)**

1. From the statutual model 

discuss the construction of ANOVA table of a latin square design (12 marks)

1. Construct ANOVA table for the following latin square design (8 marks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A1 | A2 | A3 | A4 |
| B1 | t1=8 | t2=15 | t3=12 | t4=6 |
| B2 | t4=10 | t3=11 | t2=10 | t1=8 |
| B3 | t3=4 | t4=5 | t1=2 | t2=1 |
| B4 | t2=3 | t1=5 | t4=2 | t3=2 |

**QUESTION FOUR**

1. define the following
2. Contrast (2 marks)
3. Orthogonal Latin Square design (4 marks)
4. The plant manager has decided to run an experiment to determine whether the material received at different times has the same tensile strength 5 randomly chosen times periods are to be considered and 5 randomly chosen men work on the material. The following are the results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Men** | | | | |
|  |  | 1 | 2 | 3 | 4 | 5 |
| Time period | 1 | 7.5 | 11.8 | 17.6 | 8.8 | 17.9 |
| 2 | 21.4 | 12.9 | 12.4 | 15.0 | 20.6 |
| 3 | 16.0 | 9.7 | 7.4 | 18.4 | 16.6 |
| 4 | 16.0 | 18.3 | 23.6 | 27.4 | 25.2 |
| 5 | 23.3 | 30.5 | 25.8 | 24.5 | 26.6 |

1. Test at 5% level of significant for homogeneity of the time periods and homogeneity of men (7 marks)
2. Estimate the time period variability if it is significant (4 marks)
3. What is the relative efficiency of this design compared to the CRD (3 marks)